UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/516,907 | 08/09/2005 | Thomas Paddock | ARCU-084-101 | 8733 |

28120 7590 05/25/2010

ROPES & GRAY LLP
PATENT DOCKETING 39/41
ONE INTERNATIONAL PLACE
BOSTON, MA 02110-2624

| EXAMINER | |
|---|---|
| SAUNDERS JR, JOSEPH | |
| ART UNIT | PAPER NUMBER |
| 2614 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 05/25/2010 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/516,907 | PADDOCK ET AL. | |
| | Examiner | Art Unit | |
| | Joseph Saunders | 2614 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *25 February 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *6,7,10,11,15,17,18,27 and 32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6,7,10,11,15,17,18,27 and 32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 December 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

**DETAILED ACTION**

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 25, 2010 has been entered. Claims 6, 7, 10, 11, 15, 17, 18, 27, and 32 are currently pending and considered below.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 6, 7, 10, 11, 15, 17, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Claesson et al. (2002/0075965 A1), hereinafter Claesson.

**Claim 6:** Claesson discloses a method for enhancing audio signals ("Digital Signal Processing Techniques for Improving Audio Clarity and Intelligibility"), comprising: receiving an audio signal ("in", Figure 10a); separating the audio signal into component signals corresponding to discrete bands ("Indeed, as can be seen in FIG. 10a, the input samples are pre-processed in one of four parallel paths," [0075], **"According to a**

**specific embodiment of the invention, the "transparent" path divides the audio into two bands (bass and master) and processes them individually," "The "wideband" path processes the full-range audio with only one AGC," [0066]**); processing one or more of the component signals with distinct processing pathways, resulting in processed component signals (AGC and SP. AGC, Figure 10a); aggregating the processed component signals to recreate a standard signal in one or more channels **(While Claesson states, "It should also be noted that, with some exceptions noted below, the processing blocks of processor 1000 operate in a similar manner to the corresponding blocks of processors 30 and 900 described above," [0075] suggesting therefore a mixer similar to Mixer 42 of processor 30 would be responsible for the combined signal entering block "To crossovers" of Figure 10a resulting in the Pre-processed audio, Figure 10b, it is unclear if this is indeed the case. However, Rhee discloses a similar processing method and apparatus for compensating multi-resolution linear distortion. Rhee illustrates in Figure 3, "a first filter portion 30, a second filter portion 40 and a third filter portion 50 for performing distortion compensation of the acoustic signals which are included in the respective bands of Fig. 2b, are connected in parallel to each other between an acoustic signal input end 20 and an adder 60. Adder 60 adds the signals which are supplied from the respective filter portions 30, 40 and 50," Column 5 Lines 49 – 52. Therefore, while Claesson is unclear to the step of "aggregating", it is clear from the method and apparatus of Rhee, that one of ordinary skill in the art at the time of the invention given the similarity between the invention of Claesson and**

**Rhee, would have found it obvious to include a step of "aggregating" using a "mixer" as disclosed by Rhee, thereby resulting in the advantage of a distortion compensated acoustic signal.)**; and performing additional post-processing (Figure 10b) on the standard signal to mask artifacts and response anomalies introduced by a codec and equipment used, resulting in an enhanced audio signal ("As the bandwidth of encoders are reduced relative to the bandwidth of the original audio, undesirable audible artifacts are generated. The present invention processes the audio samples such that these anticipated artifacts become less noticeable to the human ear. That is, the signal processing of the present invention allows a low bit rate encoder to be used to encode an audio stream without suffering overly much from the undesirable artifacts created by trying to faithfully reproduce a high bandwidth signal (the original audio) with a low bandwidth system (the low bit rate codec). In addition to facilitating the bandwidth savings represented by low bit rate encoders, the signal processing of the present invention may have other desirable effects such as, for example, the improvement of clarity in the presence of background noise and cut-to-cut evenness," [0058] – [0059]).

Further, while Claesson and Rhee discloses separating the audio signal into distinct processing pathways of a full bandwidth component signal ("wideband," Figure 10a) and a bass component signal, and a treble component signal (LP and HP signal via 2-way crossover 200hz, Figure 10a) and **simultaneously** processing the components within the respective pathways **(AGC or SP. AGC of LP signal, AGC or SP. AGC of HP Signal, and AP. AGC of "wideband signal", see also "filter portions," Figure 3 of Rhee)**. Claesson and Rhee do not explicitly disclose the claimed

"midrange" processing pathway. Claesson, however, does state, "It should be noted that signal processing software 140 may employ a greater or fewer number of frequency bands and processing blocks than various ones of the embodiments described herein. That is, for different applications, a greater or lesser amount of processing resources are available to effect the signal processing techniques of the present invention. For example, the available number of processing cycles in a small portable playback device such as an MP3 player may be limited. By contrast, such limitations may not exist for an audio server such as server 106 of FIG. 6," [0053]. Claesson also states, "Because the samples are divided into multiple frequency bands, the volume in each frequency band may be equalized separately and independently from the other frequency bands. Independent processing of each frequency band is desirable where there is a combination of high-pitch, low-pitch and medium-pitch instruments playing simultaneously," [0034]. Therefore while the processing stage of Claesson only discloses a 2-way crossover, it would have been obvious to one of ordinary skill in the art at the time of the invention given the aforementioned remarks by Claesson separate the signal into more than 2 pathways thereby including a midrange processing pathway in the invention of Claesson and Rhee, thus allowing for desirable independent processing for high-pitch, low-pitch and medium-pitch instruments.

**Claim 7:** Claesson and Rhee disclose a method according to claim 6, wherein the audio signal is a compressed audio signal ("MP3 encoding scheme," Claesson [0049]).

**Claim 10:** Claesson and Rhee disclose a method according to claim 6, wherein the post-processing comprises at least one of: 3D/live enhancement for adding life and stereo perspective to the sound field of the enhanced audio signal; recording environment simulation for adding diffusion, reverb, depth, regeneration, and room decay to the enhanced audio signal; voice elimination for reducing vocals in the enhanced audio signal; wide stereo enhancement for adding wider stereo perspective to the sound field of the enhanced audio signal; parametric equalization for providing broad spectrum shaping of the enhanced audio signal; filtering the enhanced audio signal to reinforce subwoofer and bass frequencies; wall simulation for producing time delays that simulate reflections from a stage; room simulation for producing time delays that simulate natural room acoustics; karaoke enhancement for removing equal energy components from left and right signal channels; vocal enhancement for clarifying vocal features; subsonic enhancement for low-bass reinforcement of the enhanced audio signal; and look-ahead automatic gain control for controlling output dynamic range ("To deal with this, NATLs 1080-1084 look at future samples and limit the gain of the current sample to avoid the distortion associated with such sharp overshoots," Claesson [0080]).

**Claim 11:** Claesson and Rhee disclose a method according to claim 6, wherein the post-processing includes room simulation for compensating for poor room acoustics in a listening environment for the enhanced audio signal ("For example, playback device 130 might be part of an audio system located inside a user's car, the dynamic processing

capabilities of the invention being employed to improve the quality of sound in the presence of the background noise typical in such an environment," Claesson [0051]).

**Claim 15** is substantially similar in scope to claim 6 and therefore is rejected for the same reasons (see also, Claesson discloses a system for enhancing audio signals (Figures 12a, 12b, and 14).

**Claim 17** is substantially similar in scope to claim 10 and therefore is rejected for the same reasons.

**Claim 18** is substantially similar in scope to claim 6 and therefore is rejected for the same reasons (see also, Claesson discloses an apparatus for playback of digital audio files (Figures 12a, 12b, and 14).

4. Claims 27 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Claesson in view Rhee and in further view of Anderson (US 4,396,806), hereinafter Anderson.

**Claim 27:** Claesson discloses a system for enhancing audio signals ("Digital Signal Processing Techniques for Improving Audio Clarity and Intelligibility"), comprising: **a processor for simultaneously processing component signals with distinct processing pathways (AGC or SP. AGC of LP signal, AGC or SP. AGC of HP**

**Signal, and AP. AGC of "wideband signal", see also "filter portions," Figure 3 of Rhee)**, including: a full bandwidth pathway for processing a full bandwidth component of an audio signal ("wideband," Figure 10a), the full bandwidth pathway producing a processed full bandwidth signal (via SP. AGC), at least one limited bandwidth pathway for processing a limited bandwidth component of the audio signal (LP and HP signal via 2-way crossover 200hz processed via AGC or SP. AGC, Figure 10a), the limited bandwidth pathway producing a processed limited bandwidth signal (via AGC and SP. AGC, Figure 10a), and a mixer configured to combine the processed full bandwidth signal and the processed limited bandwidth signal to create a mixed audio signal **(While Claesson states, "It should also be noted that, with some exceptions noted below, the processing blocks of processor 1000 operate in a similar manner to the corresponding blocks of processors 30 and 900 described above," [0075] suggesting therefore a mixer similar to Mixer 42 of processor 30 would be responsible for the combined signal entering block "To crossovers" of Figure 10a resulting in the Pre-processed audio, Figure 10b, it is unclear if this is indeed the case. However, Rhee discloses a similar processing method and apparatus for compensating multi-resolution linear distortion. Rhee illustrates in Figure 3, "a first filter portion 30, a second filter portion 40 and a third filter portion 50 for performing distortion compensation of the acoustic signals which are included in the respective bands of Fig. 2b, are connected in parallel to each other between an acoustic signal input end 20 and an adder 60. Adder 60 adds the signals which are supplied from the respective filter portions 30, 40 and 50," Column 5 Lines 49**

**– 52. Therefore, while Claesson is unclear to the step of "aggregating", it is clear from the method and apparatus of Rhee, that one of ordinary skill in the art at the time of the invention given the similarity between the invention of Claesson and Rhee, would have found it obvious to include a step of "aggregating" using a "mixer" as disclosed by Rhee, thereby resulting in the advantage of a distortion compensated acoustic signal.).**

Claesson and Rhee do not disclose the full bandwidth pathway comprising: a first input amplifier having an input for the audio signal, a first output amplifier having an output for the processed full bandwidth signal, and a first compressor connected between the first input amplifier and the first output amplifier; and further does not disclose the at least one limited bandwidth pathway comprising: a second input amplifier having an input for the audio signal, a second output amplifier having an output for the processed limited bandwidth signal, a second compressor connected between the second input amplifier and the second output amplifier, and a filter connected between the second input amplifier and the second output amplifier. Claesson does state, "A generalized topology of the present invention includes three different kinds of blocks, AGCs (including NATLs), drive blocks (e.g., drive blocks 46, 50 and 54 of FIG. 1b), and filter blocks (e.g., crossovers 36 and 44 of FIG. 1a). Signal processing networks combining these three elements in any of a wide variety of ways are considered within the scope of the invention. As described above, filter or crossover blocks typically are employed to perform a series of linear operations to separate signals into overlapping frequency bands," [0060]. Anderson discloses an audio signal processing topology

similarly comprising voltage-controlled amplifiers, filtered channels, and compressors for improving sound characteristics, and therefore within the scope of Claesson's invention. Anderson specifically teaches an input signal is processed in parallel channels, "Each channel comprises, in order, a first voltage-controlled amplifier 80, a bandpass filter 82 centered at the channel frequency, which may be for example 100 to 200 Hz first channel 26 with a center frequency at 150, and 200 to 400 Hz in second channel 27 with the center frequency at 300 Hz. Thereafter, the channel includes a voltage-controlled limiter or compressor 84 followed by a second bandpass filter 86 which in turn is followed by a second voltage-controlled amplifier 88. The outputs of the second voltage controlled amplifier 88 are mixed into a single channel, for example, at the input to a buffer amplifier 90, and fed through an output line 56 to the output amplifier 14 and thereafter to a speaker 16," Column 5 Lines 1 – 13 and Figure 3.

Anderson goes on to explain the advantages of this particular order, "Of particular interest is the order of the circuit elements in the channels 26, 27. The first voltage-controlled amplifier 80 is operative to amplify all applied signals to a level which will characterize the channel. The bandpass filter 82 which characterizes the channel passes only those frequencies within the defined channel range and attenuates all other signals, including any distorted signals introduced by the amplifier 80 outside the channel spectrum. The output of the bandpass filter 82 is coupled to the voltage-controlled compressor 84. The compressor 84 provides the amplitude limiting function for the channel, thus minimizing the possibility that amplified sounds will cause pain to the user. The output of the compressor 84 is applied to a bandpass filter 86 which is of

substantially the same design as the first bandpass filter 82 in its response characteristic to eliminate harmonic distortion or undesired effects caused by the voltage-controlled compressor 84. The output of the bandpass filter 86 is then applied to the input of a second voltage-controlled amplifier 88. The voltage-controlled amplifier 88 permits the final selection of the audio sound level in the spectrum of the channel best suited to the taste of the user. The output of the second voltage-controlled amplifier 88 is thereafter mixed with the outputs of all other channels.

In summary, the first amplifier 80 provides initial amplitude adjustment to match the characteristics of the compressor so that all input signals within the selected range of the channel are within the audio range of the listener, the second amplifier 88 provides fine control of amplitude, and the bandpass filters 82 and 86 characterize the channel. The placement of the bandpass filters 82 and 86 are selected to minimize noise caused by distortion. The levels and amplitudes of the amplifiers 80 and 88 and the compressor 84 are controlled by a voltage level," Column 5 Lines 14 - 49.

Therefore given the similarity between the processing technique disclosed by Claesson and Anderson, it would have been obvious to one of ordinary skill in the art at the time of the invention to include the processing blocks in order as disclosed by Anderson, in the parallel processing paths disclosed by Claesson and Rhee, i.e., the wideband and band limited paths, thereby allowing for the aforementioned advantages disclosed by Anderson, resulting in improved sound characteristics.

Further, while Claesson, Rhee, and Anderson disclose separating the audio signal into distinct processing pathways of a full bandwidth component signal

("wideband," Figure 10a) and a bass component signal, and a treble component signal (LP and HP signal via 2-way crossover 200hz, Figure 10a) and processing the components within the respective pathways (AGC, SP.AGC). Claesson and Rhee do not explicitly disclose the claimed "midrange" processing pathway. Claesson, however, does state, "It should be noted that signal processing software 140 may employ a greater or fewer number of frequency bands and processing blocks than various ones of the embodiments described herein. That is, for different applications, a greater or lesser amount of processing resources are available to effect the signal processing techniques of the present invention. For example, the available number of processing cycles in a small portable playback device such as an MP3 player may be limited. By contrast, such limitations may not exist for an audio server such as server 106 of FIG. 6," [0053]. Claesson also states, "Because the samples are divided into multiple frequency bands, the volume in each frequency band may be equalized separately and independently from the other frequency bands. Independent processing of each frequency band is desirable where there is a combination of high-pitch, low-pitch and medium-pitch instruments playing simultaneously," [0034]. Therefore while the processing stage of Claesson, Rhee, and Anderson only discloses a 2-way crossover, it would have been obvious to one of ordinary skill in the art at the time of the invention given the aforementioned remarks by Claesson separate the signal into more than 2 pathways thereby including a midrange processing pathway in the invention of Claesson, Rhee, and Anderson and further applying the teachings of Anderson to the

midrange pathway for the aforementioned reasons as well, thus allowing for desirable independent processing for high-pitch, low-pitch and medium-pitch instruments.

**Claim 32:** Claesson, Rhee, and Anderson disclose a system according to claim 27, further comprising a pre-compressor configured to receive an input audio signal and to generate the audio signal as a compressed representation of the input audio signal (Figure 10 b of Claesson illustrates a pre-compressor or NATLs 1 – 5 performing pre-compression on the input audio signal before mixing and subsequent compression from NATL 1092).

***Response to Arguments***

5. Applicant's arguments with respect to claims 6, 7, 10, 11, 15, 17, 18, 27, and 32 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Saunders whose telephone number is (571) 270-1063. The examiner can normally be reached on Monday - Thursday, 9:00 a.m. - 4:00 p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on (571) 272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. S./
Examiner, Art Unit 2614

/Vivian Chin/
Supervisory Patent Examiner, Art Unit 2614